

70,000; and Todd's edition of Johnson's Dictionary had 58,000. Even a general statement of the number of headings does not give an adequate impression of the amount of the contents of the present work, because, as pointed out in the preface, each word has been subdivided as far as possible into the various meanings which it has assumed at different times.

Judged simply as an ordinary dictionary, the work has high merits. No doubt, when Dr. Murray's vast undertaking is completed, both this and all other existing dictionaries will seem in many respects deficient; but for the present we do not know that anyone wishing to possess, for frequent reference, a sound, thoroughly trustworthy dictionary, could anywhere find his want more satisfactorily supplied than in these volumes. The question, what words can legitimately claim admission, had of course to be met at the outset, and it has been settled in a way that will commend itself to the judgment of all persons competent to form an opinion on the matter. All technical terms, so far as known, have been included; slang words, colloquialisms, and provincialisms have not been wholly omitted; specially coined words have also, in some instances, been recognized; and due respect has been shown to semi-naturalized words and to hybrid compounds. The department of etymology, we need hardly say, has received much careful attention; and great pains have been taken to provide quotations illustrative of every sense of each word, with references as full as could be given. The pronunciation of words is clearly indicated, and the adoption of various styles of type makes it easy for persons using the Dictionary to distinguish between various divisions and subdivisions of words.

As the title indicates, it is not merely as a dictionary that the work should be estimated. The aim has been to combine the advantages of a dictionary with those of an encyclopædia, and this idea has been realized with a remarkable degree of success. No one will expect to find here, under any heading, full information, such as one reasonably looks for in a great encyclopædia. Nothing of this kind has been attempted. But under each heading the thing is described as well as the word; and although the descriptions are necessarily brief, they are, so far as they go, clear and accurate, and no one who refers to them will afterwards have to unlearn anything they may have taught him. The short articles relating to the various branches of natural science are especially well done—a fact which will be readily understood when we say that the editor and publishers acknowledge the services of many eminent scientific workers, including Prof. Huxley, Dr. Sclater, Dr. Günther, and Mr. Carruthers.

OUR BOOK SHELF.

Manuel Pratique de Cristallographie. G. Wyrouboff. (Paris: Gauthier-Villars et Fils, 1889.)

MANY books have been written about crystallographic calculation, and their size and the uninviting appearance of their contents have probably created an impression that there is something peculiarly difficult in the subject. M. Wyrouboff's manual will not, we fear, dispel this erroneous idea, for about 300 of his pages are devoted to

an exposition of the methods of calculation; but the book, being eminently practical, consists almost entirely of examples, which are fully worked out by simple and intelligible methods, while very little space is wasted upon the geometrical principles involved. The work is therefore very different in character from the geometrical treatises which have frequently adorned the subject, and will doubtless be of great use to the class for whom it is written—namely, “those to whom crystallography is only a means for the determination and description of species,” to whom and to all who are attempting to acquire a practical knowledge of crystallography it may be warmly recommended. We would only suggest to such two words of caution: in the first place, the calculations are in each case conducted in two ways, by means of plane angles and solid geometry, and by means of spherical trigonometry,—the former method is unnecessary and undesirable; in the second place, the Millerian axes and notation of three indices should certainly be used in the rhombohedral system in preference to the notation of four axes.

M. Wyrouboff is so well known as the author of valuable contributions to the science of crystallography (by which we mean the knowledge of the relation between the physical, chemical, and geometrical characters of crystals as distinguished from either the study of mineralogy or the art of crystal-measurement), that the following remarks, taken from his preface, deserve particular attention:—

“How far more advanced would be our knowledge of the intimate structure of bodies if chemists were to describe accurately the form of the innumerable substances which issue from their laboratories, and which, being sometimes accidentally obtained, difficult to reproduce, or prone to rapid decomposition, are lost to science; and if, on the other hand, physicists were accustomed to connect the properties which they discover with the symmetry which belongs to the crystalline exterior. It is true that in doubtful cases, or such as are of particular interest, they both have willing recourse to the professional crystallographer; but, apart from the fact that he is not always at hand, experience teaches that such a division of labour rarely gives good results. Forms placed in arbitrary positions without regard to the forms of allied substances often serve only to conceal the analogies which are professedly sought,” &c.

From which we gather that the position of crystallography in France is much the same as in England, and that such books as that of M. Wyrouboff, although not liable to be choked by the thorns of competition, are at present somewhat likely to fall upon the stony ground of indifference.

Assistant to the Board of Trade Examinations. By Captain D. Forbes, F.R.A.S. (London: Relfe Bros., 1888.)

IN preparing candidates for the Board of Trade examinations for officers' certificates, Captain Forbes has felt the want of a handy book of reference to the various questions asked, and he hopes to supply that want by the little book before us. In these examinations, the candidate has to show his knowledge by answering a number of a set of questions which is the same from year to year, although those selected by the examiner may be different. The questions put to the candidates, and the answers to them which the author suggests, are given in this little book. As examples of brevity, the definitions given of the various astronomical terms are unequalled in any book we are acquainted with. Thus, right ascension is defined as “the distance which a heavenly body is eastward of the first point of Aries”; while not the slightest idea is given of the meaning of the latter term. On p. 14, sidereal time is stated to begin when the first point of Aries is on the meridian, and to end when it returns to it

again; how much information this will convey to a student we leave our readers to judge. The answers to the various questions which are asked on the sextant are far better than the definitions, as are also the answers to the questions on cyclones. The questions on the deviation of the compass, for masters' certificates, are also fairly well answered, although a little further explanation of Napier's diagram, which forms the frontispiece, might have been given with advantage.

For reference to the questions given, the book will no doubt be very useful to intending candidates, but the answers given are good examples of the system of cramming for examinations, which cannot be too strongly condemned.

Guatemala: The Land of the Quetzal. By William T. Brigham. (London: Fisher Unwin.)

MR. BRIGHAM, an American author, has made three journeys in Guatemala, and in the present volume he has brought together all that seemed to be important in the notes written during his travels. The work is one of great interest, and ought to be not less welcome to the general reader than to persons who have special reasons for studying the subject. Mr. Brigham is a keen observer, and records his impressions clearly, simply, and effectively. No one who, in imagination, attends him in his course across the continent to Coban, from Coban to Quezaltenango, from Quezaltenango to the Pacific, will fail to be attracted by what he has to say about the physical features of the country and about the manners of its inhabitants. There are also excellent chapters on Guatemala city, and on Esquipulas and Quirigua. A sufficiently full account is given of the vegetable and animal productions of Guatemala, and of its earthquakes and volcanoes. In an introductory chapter, Mr. Brigham has something to tell us about Central America generally, and it may be worth noting that these regions will one day, in his opinion, be "the garden and orchard of the United States, not necessarily by political annexation, but by commercial intercourse." Great care has been taken to secure the accuracy of the illustrations, most of which are direct reproductions from negatives.

LETTERS TO THE EDITOR.

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Weismann's Theory of Variation.

I THINK it may be reasonably objected to Mr. Cunningham's ingenious *reductio ad absurdum* of Weismann's theory, that because we cannot exactly state what happens in the mysterious fusion of sperm- and germ-nucleus, it by no means follows that such fusion does not largely account for the observed variation. I say largely, because Prof. Weismann's more recent paper, "Ueber die Zahl der Richtungskörper und über ihre Bedeutung für die Vererbung" (Jena, 1887), completes in a most important manner the paper quoted and criticized by Mr. Cunningham.

The argument is briefly as follows. The expulsion of the second polar body by sexual eggs is the removal of half the ancestral germ-plasms in order to make room for those which are added in fertilization. For this reason we must suppose that an equivalent reduction of the sperm-nucleus also takes place. If this reduction did not occur, the number of germ-plasms would be doubled in each sexually-produced generation—an unthinkable result.

If there were only one kind of germ-plasm in each nucleus, and sexual reproduction commenced, there would be 1024 distinct germ-plasms in each of them at the end of ten generations. But the number of generations must be so vastly in excess of ten that the number of ancestral germ-plasms in each sperm- and

germ-nucleus must be considered to be infinite, or at any rate so large that the expelled halves would never be the same. It therefore follows that no two sperm- or germ-nuclei can be alike, and individual variation must follow. A little consideration also shows that while the children of the same parents must differ, they must also resemble each other more than the children of other parents, and while they must differ from their parents they must also resemble them more than the parents of other children.

The occurrence of atavism may be explained as a direct consequence of an unusual predominance of ancestral germ-plasms; the fact that atavism is a rare exception also follows from the fact that the expulsion of half the germ-plasms in each generation will nearly always prevent such predominance.

It is impossible to carry the subject further in the scope of a letter, or one might refer to the evidence for the absence of variability in parthenogenetic species, in which the second polar body is not expelled from the ovum; and to the identity of twins produced from a single ovum which has presumably divided after fertilization.

E. B. POULTON.

Oxford.

A Correction.

WITH reference to my communication in last week's NATURE, Prof. Oliver Lodge has called our attention to the fact that we had made a mistake in stating that the wave-length of the vibration was 33 centimetres. It is the semi-wave-length that is 33 centimetres; the wave-length is 66 centimetres, as is evident on consideration of the size of the "vibrator."

FRED. T. TROUTON.

Temperature Observations in Rivers.

THE Committee appointed at the Bath meeting of the British Association to investigate seasonal variations of temperature in rivers and streams was able to arrange through local scientific Societies for thirty observers, commencing work in January 1889. Of these there are ten in England, ten in Scotland, and ten in Ireland. Each observer is supplied with a specially designed thermometer (costing 2s. 6d.) which has been compared with a standard instrument, and books for recording the observations and full instructions are provided by the Committee. It is desirable to extend the observations to rivers not yet taken up, and I therefore wish to direct the attention of local scientific Societies, of meteorological observers and others interested in similar work, to the opportunity now offered of taking part in a systematic investigation, the preliminary results of which show many interesting features. I shall be pleased to answer any inquiries of intending observers.

HUGH ROBERT MILL,

Secretary Brit. Assoc. Committee.

Heriot-Watt College, Edinburgh, February 20.

"Bishop's Ring."

IN your review of the Report of the Krakatão Committee of the Royal Society, it is stated that "Bishop's ring" has quite disappeared. Now this is hardly correct, for although I have not heard of anyone perceiving it in the middle of the day for a long time past, it is still visible about sunrise and sunset, though becoming on the whole gradually fainter. I presume that it is really the same phenomenon. At the time when "Bishop's ring" was most conspicuous in the full day-time, it was always far more so when the sun was rising and setting.

Sunderland, February 20.

T. W. BACKHOUSE.

Peripatus in Australia.

Peripatus has been found not only in Queensland and Victoria, but also at Cassilis, in New South Wales, by Mr. A. S. Olliff, of Sydney. The Victorian and New South Wales localities are recorded in a postscript appended to my monograph of the genus as reprinted from vol. iv. of the "Studies from the Morphological Laboratory of the University of Cambridge." My knowledge of them is due to Mr. Olliff, who was kind enough to send me his specimen and his description of it (Proc. Linn. Soc. of